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SHORT COMMUNICATION

Variability in heat tolerance in Bambara groundnut (*Vigna subterranea* (L.) Verdc.)

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Abstract Four Bambara groundnut landraces (*Vigna subterranea* (L.) Verdc.) of African origin (S-165 A, DodR, Uniswa red and SB-42), were grown at research farm of Central Arid Zone Research Institute, Regional Research Station, Bikaner to evaluate for heat tolerance based on the cell membrane thermostability of leaf tissue by using five temperature treatments (40, 45, 50, 55 and 60 °C) and four heating durations (15, 30, 45 and 60 min). Lethal temperature and lethal heating duration was used as the selection criteria for heat tolerance. Significant genotypic variations were evident for both lethal temperature and lethal heating duration. A strong relationship between lethal temperature and lethal heating duration indicates that any one of two parameters can be used as selection criteria for screening Bambara groundnut genotypes for heat tolerance. However, the range of lethal temperature was too narrow (47.5–49.4 °C), whereas the range of lethal heating duration was fairly longer (39.9–48 min) to distinguish the genotypes. Further, there was strong and significant relationship between lethal heating duration and relative injury under heat stress at 50 °C. From this study it can be concluded that lethal heating duration at 50 °C is a potential selection criterion for identifying heat tolerant genotypes in Bambara groundnut.

Keywords Bambara groundnut · Lethal temperature · Lethal heating duration · Heat tolerance · Membrane thermostability

Bambara groundnut (*Vigna subterranea* (L.) Verdc.) is a traditional African crop that has been cultivated in Africa for centuries for human consumption (Brough and Azam-Ali 1992; Azam-Ali et al. 2004; Berchie et al. 2010; Brink and Belay 2006). The seeds of Bambara groundnut make a complete food, as it contains sufficient quantities of protein (16–25 %), carbohydrate (42–60 %), essential amino acids (32.7 % of total amino acids) and energy (Minka and Bruneteau 2000; Amarteifio et al. 2006; FAO 1982). Relative to groundnut, the crop is low in lipids (5–6 %), which gives it a distinct food value (Poulter and Caygill 1980; Brough and Azam-Ali 1992). It is known as a well adapted crop to harsh climatic conditions (Heller et al. 1997). Agronomic evaluations have shown that Bambara groundnut yield ranged from 0.3 t ha^{-1} under marginal conditions to 4.2 t ha^{-1} with improved cultivars under optimum conditions (Madamba 1995; Collinson et al. 2000; Swanevelder 1998). The crop has been under-utilised and under researched compared with investigation made on sorghum, millet, maize, peanut and cowpea (Drabo et al. 1997). In recent years, scientists in Africa and Europe have emphasised the need to expand the cultivation of Bambara groundnut beyond its historical centre of diversity to other semi-arid and arid groundnut growing areas of India facing drought and heat stress. One of such regions is western Rajasthan in India, which is characterised by high temperature (48 °C in summer) and long drought. The preliminary research conducted in semi arid India shows that the crop can be grown in sandy soils with low fertility (Singh and Basu 2006a b, c). Since Bambara groundnut

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